A

DISCOURSE

Concerning the

VEGETATION

OF

PLANTS.

Spoken by

Sir *KENELME DIGBY*,

at *Gresham College*, on the

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OF THE VEGETATION OF PLANTS.

THe Subject upon which you have commanded me now to discourse unto you (most honoured President, and most worthy *Academists*) is of so large an extent, and of so abstruse a

nature, and brancheth out into ſo many refined ſpeculations (all which derive their origine from the ſame ſource) that I cannot hope to give you content about it, in ſo ſhort a ſpace as you have confined every one of our Society unto, when they have the honour of ſpeaking to you: Nor can you with reaſon expect that without premeditation, I ſhould be able to penetrate into thoſe moſt hidden Myſteries of Nature, which this matter leadeth me neceſſarily unto. For, to give you a due account of the Vegetation of Plants; I ſhould firſt examine the natures of Rarefaction,

ction, of Condenſation, of Filtration, of Fermentation, of Attraction, of Imbibition, of Concoction, of Augmentation, of Nouriſhment, of Aſſimilation, and of ſundry other actions or vertues (as we may term them) of the like ſtrain: Which I ſhould no ſooner have made an end of, and have ſhewed you wherein conſiſt the life and the death of a Vegetable; but preſently I ſhould have in my view, the reparation of a decaying life, and the reproduction of a faded one; and ſo ingulfe my ſelf in the myſterious contemplation of the reſurrection of dead and diſſipated bodies, and how

they may continue the ſame individuation, and be again the ſame identicall body, after ſo many ſtrange changes, and after having put on ſo many different habits and ſhapes, as we daily ſee in the courſe of Nature. To ayme at performing all this, would be as fond a thought, as to put to Sea in a pair of Oars, with deſign to circle the whole Earth, and viſit both the Poles. Yet ſince upon Mr. Surveyours motion to you, (upon occaſion of what was juſt now, ſo ingeniouſly delivered by our acute, learned, and judicious Aſſociate Dr. *Goddard* about the growing of Trees) you have thought

thought good to command me to entertain you with my reflections upon this ſubject, I will in obedience thereunto give you ſuch hints as may ſtir up others, by following them, to make a complete and poliſhed piece of that whereof I ſhall ſet before you only a rough draught; yet it ſhall be compoſed of ſuch naturall and aſſured ſtroaks, as may perſwade you that there is no inſuperable difficulty, nor inſcrutable darkneſs in all this ſo admired progreſs.

But let us look upon it, ſtep by ſtep; and conſider at every joynt or change, what new ſhape ought in

reaſon appear next, and what new product is likely from time to time to ariſe out of the immediately preceding compoſition, ſo tempered, ſo qualified, and ſo accompanyed with all its Concomitant accidents; and we ſhall preſently conclude, that it would have been impoſſible any other thing imaginable ſhould have reſulted out of theſe principles and circumſtances, then what hath been thus born out of Natures fertile womb: And be the ſeed never ſo remote from any appearing affinity with the Plant or Tree that at the laſt groweth out of it; yet by this heed-

heedfull ſurvey it will be evident unto us, that as long as water performeth the action of wetting, fire that of burning, the Earth that of conſtipating and giving conſiſtence to fluid bodies, and the aire that of mellowing and ripening what is expoſed to his embraces; in a word, that as long as nature proceedeth in her regular courſe to perform theſe familiar actions which we are daily witneſſes of, and which we find no difficulty to underſtand; ſo long (I ſay) it is impoſſible, that any other thing in the World ſhould grow (for example) out of a little ſhrunk Akehorne,

then a ſpread vaſt Oake; or out of a ſingle Bean, then that tall, green, tender Plant ſo furniſhed with ſtalk, leaves, flowers, buds, ſeeds, (all in their ſeverall ſeaſons) which appeareth ſo differing from that dry, hard grain firſt thrown into the Earth. Let us date the beginning of our obſervation from thence. This dry ſhrunk compacted ſubſtance, being buryed ſlightly in the moiſt ground, at a ſeaſon when the approaching Sun (the great *Archeus* and fire of nature) beginning to dilate and ſublime up to the Superficies of the Earth, that volatile and balſamick ſalt which his re-

remoteneſſe during the Winter had ſuffered to be ſhrunk up together, and condenſed and ſunk deeper towards the Center; muſt of neceſſity receive into its ſubſtance, that ſaline humidity which environeth it, is contiguous to it, and on all hands preſſeth upon it. The immediate effect of this humecting of the Bean or Akehorne, muſt neceſſarily be that it ſwelleth and groweth bigger: for the ſubſtance of the water getting into the very ſubſtance of the grain that lyeth ſoaking in it; thoſe two ſubſtances cannot chooſe but take up a larger room then formerly did belong

long to only one of them ſingle. And from thence it will follow, that the skin which wrappeth up and containeth the ſubſtance of the Bean, muſt needs crack and tear to afford way and liberty to the dilatation of the ſwelled body: which having thus obtained room for it ſelf to perform ſuch actions as in thoſe circumſtances are naturall and neceſſary to it (whereas, before it was ſhut up and fettered in a cold, dry, and hard outſide) it followeth preſently its own ſwing; and in that little naturall body, we may read the fate which hangeth over political ones, when

when the inferiour Members that ſhould ſtudy nothing but obedience, have gotten the power into their hands: for then every one of them following their impetuous inclinations, the whole is brought into confuſion; and that is deſtroyed which every one in their tumultuary way aimed to gain the Maſtery of; unleſſe a ſuperiour Architect, as in the preſent caſe of our bleeding Nation,

everſo miſſus ſuccurere ſeclo,

do come to draw light and order, out of that darkneſſe and confuſion. It will hap-

happen then to this ſwollen Bean, now broken priſon, that the fiery parts of it will work to gain dominion of the watry ones; and they calling the cold and dry ones to their ſeveral aides, will make a violent agitation through the whole maſſe, working and kneading the one into the other. This inteſtine motion, will cauſe a greater dilatation of the body ſo in combuſtion, then the firſt humecting of it did. For, the naturall action of fire being to ſtream out from its Center on all hands in a continued floud of extreamly rarifyed atomes; and they carrying along with

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ted, and put in poſſeſſion of their native vertue; and the feculent, inſipide, earthy ones are caſt out from having any Society with them. But you do not expect from me (my honoured hearers) that I ſhould diſcuſs the Doctrine of fermentation to the utmoſt ſcope and extent of it; which as it is one of the nobleſt and excellenteſt works of nature, and indeed the key to enter into the knowledge of all the actions and changes that are wrought under the Sun; ſo it requireth a particular treatiſe entirely to it ſelf, and will take up a whole man todraw a complete Map of its

with them as continued a ſequel of moiſt and viſcous ones; it will neceſſarily follow, that they muſt have a larger field then originally they had to play their game in. Thus far of this work belongeth to fermentation, which if it grow ſo violent that the fiery and ſpirituall parts do get quite looſe from the viſcous ones; then that which followeth, is a totall Putrefaction, Diſſolution, and Deſtruction of the compound: But if it be kept within its due limits, then the body in which it was wrought, is raiſed to a nobler pitch, and the Ethereall ſpirits of it are actuated,

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its Empire. He will find that there is no diſeaſe in mans body, but ſpringeth from fermentation; which when it groweth ſo violent and unruly, that the fermented humours can no longer be contained within their oppreſſed veſſels, or that it is continued ſo long, that the ſpirits fly quite away, and thereby deliver over the remaining Maſs to Putrefaction and Rottenneſs; Death, which is an eſſentiall diſſolution of the whole compound, muſt neceſſarily follow. He will find that the cures of all diſeaſes do proceed from ſometimes raiſing fermentaton toa due

pitch,

pitch, that it may caſt off what is hurtfull to the whole compound; and otherwhiles precipitating it, ſo that all the tumultuary motions of it may be compoſed, and a perfect calm may be induced in place of it. And laſtly, (not to trouble you with too many particulars, ariſing out of a digreſſion) he will find that when ever nature intendeth the betterment of any body, ſhe beginneth with diſſolving and fermenting it in its due liquor; that ſo each eſſential part may be ſevered from his fellow, and refined to a nobler ſtate then it enjoyed before; and then joyned a-

gain

gain in a much perfecter ſociety with his equally ennobled companions, after the incorrigible *faces* are thrown from their harmony and union. Thus plain Clay with water from Heaven, may be brought to a chriſtaline purity and permanence; and Gold to one of thoſe gems, which in the *Apocalips* we are told ſerve for the Pavement of the heavenly *Jeruſalem*. Find but a *menſtruum* of its own nature, in which it may be radically diſſolved and fermented; and the reſt of the work will be eaſie. But to make our Bean grow, we need not ſo great curioſity; and yet

give

give me leave to ſay, the linear way of the one, is not more plain and eaſie than that of the other, to him that knoweth them. But be this how it will: As to the Bean, although the ſwelling and burſting forth of the fiery and viſcous parts of it, will be towards all ſides, according to the nature of fire, which ſtreameth out from the center every way to the circumference, yet it will be moſt efficacious upwards towards the air, becauſe it meeteth with leſſe reſiſtance that way, than any other: For downwards the Earth lyeth more compacted than it doth over the grain,

grain, it having been ſtirred and broken to make the Mould looſe and porous; and beſides, there is a great quantity of it, which the further you go downwards, groweth the more difficultly penetrable; whereas, from the grain to the ſuperficies of the Earth, and to the free air, the journey is very ſmall, and no obſtacles in the way, by reaſon the Sun, Air, Dew and Rain do ſtill work upon it to make it light and ſpungy. Upwards then, and towards the air muſt be the ſpeedieſt and the greateſt concourſe of theſe hot and viſcous ſtreams; which coming into

to the cold air, and being invaded by it on every hand, they contract themſelves into ſuch a figure, as is fitteſt to reſiſt the aſſaults of ſuch an enemy; which is the circular one: for (to ſpeak phyſically) the ambient air preſſing theſe ſtreams on all ſides, reduceth them into the narroweſt room poſſible to ſerve them: and the circular figure being the moſt capacious of all others whatſoever, the cold air condenſeth them into it, that ſo moſt matter may be contained in leaſt ſpace. In the mean time, the ſtreams out of the cracked skin of the Bean downwards and ſidewards

wards, are not altogether inefficacious, though not so vigorous as those that ascend upwards towards the air. There will be this difference between the ascending and the descending or spreading parts, which flow out of the fermenting mass; that the first will be hot, moist, aiery, and consequently green and tender ones; the others will be more dry, cold, earthy; and therefore rough, hard and white; whose hardnesse and roughnesse will also be encreased by the Earths pressing upon it. Thus then the root is formed, which drawing continually new

juyce to it from the moiſt Earth that environeth it, and abounding with heat that ſtill digeſteth and ſublimeth up the moiſture it ſucketh in; and the outward agents (that is, the Sun and Aire) performing alſo their parts; it followeth that new digeſted and ſpiritual juyce is continually ſublimed up into that round, green, tender part, which was ſprung up out of the Earth into the aire; and that now we may call the ſtalk. Thus both the innate and the extern heat, do concur to enlarge this plant, by filling both the root and the ſtalk of it with continual

new

new moisture: whereof the one being exposed to the Sun and Winde, must needs grow rough and hard on the out-side; to defend from outward injuries of weather, the inner-part that remaineth tender and juicy, and would else be soon nipped in its ascending; and the other thrusteth down continually hard parts deeper into the Earth, whereby it remaineth firm and able to resist the agitations of the wind, without being easily eradicated. Now it fareth with the plant, as with a kindled fire of wood; the more fewell is applyed to feed it, the more groweth

the heat: ſo here, the daily and hourly accrewing of new balſamick juyce, encreaſeth the heat that is within the plant; and conſequently there is continually more and more juyce ſent upwards. Thus the ſtalk groweth higher. But the further that this aſcending juice goeth from the maine Center of it that ſublimed it up, the weaker and fainter it becometh, and the leſs able to reſiſt the invaſions of the cold ambient aire. So that, when it can creep up no higher, it ſettleth there: Yet continually the innate heat ſublimeth up more and more juicy, which not being able

able to pierce the skin that it meeteth with at its journys end, it swelleth there into a button, that groweth continually bigger and bigger, till at length the skin that enwrappeth this subliming and daily more digested juyce, not being able any longer to contain the quantity and activity of it, breaketh; and from that cloven button or knot, new juyce ascendeth in the same manner and progress as before; till at a just distance, proportioned to the causes that produce it, a new knot is made; And so from one to another, every one less then the other, till at length

there wanteth juyce to drive the Plant any higher; and withall, the ſubliming heat groweth fainter at ſo great a diſtance; and the Sun beginneth to grow leſs active upon it; And in a word, the whole œconomy of nature conſpireth to ſet here a period to the extenſion of the Plant. Some plants do uſe to ſhoot only upwards; but in others, when the button is forced aſunder by the aſcending juyce; that juyce puſheth out as well to the ſides as upwards; and ſo a branch is made, breaking out of the main ſtock: And it hapneth that there do break out ſo many ſuch branches,

branches, as there are concurrent circumſtances and accidents (ſuch as we have here mentioned) to form them. But when nature hath ſet a period to the extent of her growing Plant, and is as it were weary of teeming any longer with ſuch ſtrong and nervous iſſues (that is to ſay, that the innate heat, the juyce, and the Sun, do begin to flag in their operations, (for the reaſons I have touched) and yet never conſenting to be idle and ſit ſtill, ſhe betaketh her ſelf to works of leſs robuſtuous force; and refining ſtill more and more by gentle ſublimations and de-

purations, the juyce ſhe hath brought up thus high, ſhe continually maketh it caſt off the groſſer parts, which ſtick by the way as not being nimble enough to riſe higher, nor ſubtill enough to paſs through thoſe ſtreight channels which afford the refined ſpirits an eaſie courſe. Yet are not theſe groſs parts without employment (I call them groſſe, only in reſpect of the purer ſpirit; for otherwiſe they are much more ſubtill and concocted, then thoſe which remain in the ſtalk, trunk, or bark of the plant) it is true, they are not able to go along with the

æthereal

æthereal ſpirit, which taketh a higher flight, as you ſhall by and by hear. And they are continually encreaſed with hourly ſupplies of like groſs or ſubtill parts as you will pleaſe to call them: for indeed they are either, or both; ſubtill in reſpect of the groſſer juyce they are ſublimed from, and that remaineth below in the body and trunk of the plant; And groſs in reſpect of the ardent ſpirit and balſamick oyle that is rectifyed from them. This perpetuall new concourſe of freſh matter to the branches, which grow too full to contain it, is the cauſe of their cleaving

in ſeveral places where this juyce puſheth to get out. If it be very viſcous and unctuous, and have been long concocted by the Sun without and the innate heat within, before it breaketh out; it ſhoweth it ſelf in a gummy ſubſtance, that retaineth in it the nature of the whole Plant; as I ſhall hereafter convince experimentally, beſides the evidence of the reaſon that concludeth it muſt be ſo. But if nothing have intervened to hinder or alter the ordinary courſe; then, this more watry then unctuous juyce, making its way into the aire through the tender skin

skin of the branch or ſtalk, ſuffereth all the like actions upon it as were formerly wrought upon the firſt juyce that broke out of the original Bean or Akehorne; and ſo it beginneth to be formed there into a new Plant, of a ſhape, figure, and nature proportioned to the great one it ſhooteth from. Firſt, a thridde ſhooteth out in a direct line, that we may fitly call the ſtalk of this new little Plant; and at a diſtance adequate to the heat that ſublimeth and puſheth it out, and to the cold aire that nippeth and ſhrinketh it into a button, the firſt knot is formed in this

this little ſtalk: from whence new ſtreames or thredds are puſhed out, both forwards and ſide-wayes, as we have formerly explicated in the firſt groſſe forming of the bulky plant. Theſe thredds that are thus ſpun out every way one from another, do grow to be ſo near one another, that the ſteams which neceſſarily muſt accompany them (for whereſoever heat driveth out ſtore of moiſture, there cannot chooſe but be an atmoſphere of emanations environing and beſieging, as I may ſay the main ſtream) do eaſily mingle with one another; and being of a viſcous,

viſcous and adhæſive nature (as all ſuch moiſt and hot emanations muſt neceſſarily be) they fill up with their glewy matter the intervalls between the main threds. Which we may compare, not improperly to a curious Work-womans filling up of Flanders-lace with fine thred: in the doing whereof, ſhe interweaveth ſo cunningly the thred ſhe bringeth, with thoſe ſtanderds of threds (as I may call them) that ſhe already findeth in her work before her, that whiles ſhe filleth up all the vacuities, ſhe ſtill leaveth thoſe main threds ſo diſcernable, that your eye

eye can after all diſtinguiſh the work of the Pattern as clearly as if there had been nothing done to it. And ſo in this filling up the interſtices of the new little Plant, you ſee plainly all the ſinews and threds of it after the viſcous ſteames which hang about them are plaited and wrought into a continuate ſubſtance, that is jagged or dentelated according as the main threds are puſhed forth to be longer or ſhorter, which dependeth upon the heat that carryeth the viſcous parts with it. And thus the leaf, a ſecond Plant is formed out of the branches and twigs of the

firſt,

first, retaining the shape, figure, and other qualities of it. Now all the while that this is doing with the grosser parts, which the rectifyed spirit casteth off; The heat which rectifyeth and sublimeth it, pusheth forth this elaborate juyce into more tender substances, more abounding with vigour and spirits; Especially at the extremity of the branches, where the solidest part of the abounding humour groweth (as before in the rising of it in the stalk of the Bean, or in the body of the Oak) into a button; but the more volatile and lesse substantial part of this high-

highly rectifyed juyce or rather new ſpirit, is ſpread round about it in thin ſheets; which being full of the aereal and ſulphureous parts of this rectifyed ſpirit (which here by the iterated rectifications, becometh like an ardent water) delighteth the eyes with variety of colours, and the noſe with pleaſantneſſe of ſmell (for ſulphur is the univerſal great painter and perfumer of the world) but being of ſo volatile a nature as the much refining and often rectifying it, reduceth it to be of; theſe flowers are not of long durance, but ſoon fade and fall away, as alſo their beau-

beautifull and odorous ſpirits exhale from their dead and withered habitations. But all this while that this æthereal or wild ſpirit recreateth himſelf thus in theſe tranſitory flowers; a more ſolid and ſubſtantiall one, and that endureth a more vigorous concoction, (as in diſtillations, where the balſamick oyle cometh laſt) filleth and ſwelleth the button that hath by this time loſt his gay companions, the faded flowers. And as it groweth bigger, it groweth alſo ſofter and tenderer in the whole bulk of it. For, the Sun ſtill draweth to the outſide, the ſubtileſt, the moſt

moſt jucy, and the moſt aereall parts of it: and therefore all that ſubſtance muſt be ſoft, mellow, and tender; only the extremity and the laſt ſuperficies of the outſide, muſt needs have contracted ſome hardneſſe and roughneſſe, from the coldneſſe of the aire, and the biting ſharpneſſe of the wind, which maketh the skin of a Pear, or Apple, or Walnut, rougher and harder then the pulpy tender ſubſtance next adjoyning to it. Yet out of the courſe here ſet down, it will follow that towards the center of this tender ſubſtance there muſt needs be ſome hard,

hard, dry, and rough matter. For, seeing that the Sunne from without attracteth to the superficies of the fruit the most spiritfull and aery parts of the ascending juyce; and that on the other side the innate heat from within driveth it out, and extendeth it from the Center to the superficies: It is impossible but that about the middle from whence all this attraction and expulsion of tender juyce is made, there must remain store of Earthy parts deprived of moisture, and baked into a hard nucleous substance, containing much of fire; though little of aire

and

and water in it. For it is the nature of fire to incorporate it ſelf with the ſubſtance it baketh and calcineth; as you have a ſenſible experience in the calcining of Antimony by a burning-glaſſe, when the calcined body encreaſeth much in weight, though at the ſame time the fire driveth away a wonderfull quantity of the moiſt and volatile parts of the ſmoaking maſs. This button, thus dilated and brought to this paſs, we call the fruit of the plant: whoſe harder part, encloſeth oftentimes another that is not ſo hard as it is dry. And the reaſon of this

this is, that the outside or superficies of this Earthy substance, is become so exceeding hard by the concurring causes which make it so, that no moisture (or at least in no considerable quantity) can soak through it. And then, the action of heat being continually prevalent upon what hath no supply of moisture, it must necessarily follow that all the substance which is enclosed within that hard superficies, must needs grow dryer and dryer; till at length it becometh like fine subtile dust compacted together; which sheweth it self to be so, asoon

as

as it is bruiſed out of the husk that containeth it: as we daily ſee in Corn ground at a Mill; and it is as evident in the kernells or little ſeeds of Peares, Apples, Orenges, Almonds, and the like; if you work in like manner upon them, after they are throughly dryed. Yet this dryneſſe is not to ſuch a degree, as when in Calcination by violence of fire the moiſt and volatile Eſſentiall parts of a body are entirely driven away. For here the agents being gentle and naturall ones, and the ambient moiſture and cold defending the

ſeed from exceſſe of drought and heat, and the whole courſe of this progreſſe tending rather to Fixation then to Calcination; It happeneth that in every parparcell of this compacted duſt, the nature of the whole Plant reſideth perfectly and entirely; as it were, contracted into a ſmall quantity. For, the juyce which was firſt in the button, (that is now become the fruit) and had paſſed from the root through the manifold varieties of the divers parts of the Plant, and had ſuffered much concoction and depu-

depuration, partly from the Sun and partly from the inward heat impriſoſed in that harder ſtony part about the middle of the fruit; is by theſe paſſages, ſtrainings, concoctions, and ſublimations, become at length to be of the nature of a tincture extracted out of the whole plant; and is at laſt dryed up into a kind of Magiſtery, full of Fire and of Salt. This is that which we call the Seed; which being buryed in the Earth, and ſoaked with fitting humidity, in ſuch ſort as we have here at large declared, ſetteth on foot this work anew, and repeateth over

again

again all that we have hitherther obſerved in this long progreſſe: in which the ſteadineſſe of the Supreme Architects hand that ſteereth and governeth it, is never enough to be admired; who hath ſet on foot ſuch an exact concurrence of divers and moſt diſtinct cauſes, to conſpire all to one and the ſame end, that ſtill in generall nature ariveth to her deſtined period without being fruſtrated of the ſcope ſhe levelleth at. Whereas a man that ſhould ſtay his conſideration at every joynt of this long carreer, and ſhould reflect how ea-

ſily ſome little circumſtance in ſo vaſt a multiplicity of them might be turned awry (as when an atome of duſt falleth among the wheeles of a nice clock) or rather, how difficult it muſt needs be for one ſingle governour to keep them all in their due æquilibrity; might be apt to conclude that not one of ten thouſand ſhould prove as it doth. And he that ſhould look barely upon the two extreme terms, the beginning and the completing of a plant, might think there were a perpetuall miracle in the production of vegetables, and

and might be excuſed for having recourſe to a *vis formatrix*, and ſuch other inſignificant terms. But another that conſidereth the whole courſe of nature ſet on foot by God Almighty for this admirable work; and fixeth his foot at every particular joynt, not ſtirring it from thence till he have fully examined and diſcuſſed what muſt neceſſarily follow out of ſuch or ſuch matter, in ſuch or ſuch circumſtances, ſo and ſo tempered, and ſo and ſo wrought upon; will evidently diſcern that it is throughout impoſſible, any thing ſhould

happen in it otherwiſe then juſt what and how it doth. And it is want of conſideration and of judgement, which maketh men fly to occult and imaginary qualities, to ſhroud their ignorance under inconceiveable termes: Whereas nature in her ſelf is pervious and open to humane diſcovery, if a due courſe be taken to diſſect and ſurvay her.

Out of what I have diſcourſed of the progreſſe of Nature in the growth of Trees, and of all manner of Plants, it will be eaſie to ſatisfie ſuch Queſtions and Doubts concerning them, as

as at the first sight may seem full of difficulty. As for example; why the grain of a tree should affect such or such a situation and tendence in respect of the great Universe, which some shallow Clerkes will have passe among the recondite Mysteries of Nature, shut up to mortall eyes; further then that they will have a secret instinct and sympathy to be between Plants and the polar Star. All which is nothing but this, that the tender plant at its first pushing forth, being checked by the ambient aire, and warmed by the en-

livening Sunne; is moſt ſtreightned by the cold Earthy atomes which are drawn by the Sunne from the Poles to the Æquator. For there being a conſtant perpetuall courſe of them that way (as I have ſhewed in my Book of Bodies) ſuch things as lie in their Channell muſt neceſſarily be affected with their continually repeated ſtroaks. And that ſide of them which is expoſed to their immediate blowes, muſt be moſt ſenſible of them. On the other ſide the Sunne with his warme and moiſt Regiment of atomes,

atomes, embracing the oppoſite part of the plant, muſt needs work a contrary effect to the other. And thus you ſee a plain and evident reaſon, why one ſide of the plant cannot fail of being cloſe, hard, and heavy in reſpect of the other, and tending to ſome acuteneſſe rather then perfect round. The other will be ſpungy, tender, light, and dilated; having its Figure enlarged beyond roundneſſe. Now this firſt impreſſion ſerving for a Rule to what afterwards ſhall follow, and the outward caſe of

the plant, being as it were a mould to caſt the ſucceeding juyce in; it will follow that at every Year, or Moneth, or Week, (according to the nature of the plant) when new juyce is ſublimed up into the hardned caſe, and that this new juyce diſcendeth the caſe to make room for it ſelf, it will take ſuch ply and Figure, acuminated on the one ſide and obtuſe on the other, as the caſe already hath, and is apt to give. This will be repeated every year in Trees and in ſuch plants as count their livelihood by years.

And

And by theſe circles of the grain, you ſhall not onely know how the Tree grew, where it was planted in regard of North and South; but alſo how old it is. And if you will tranſplant it to another place, you muſt have a care to ſet it in the ſame Situation it firſt grew in; for otherwiſe, expoſing the tender, mellow, South-ſide of the Tree, to the ſharp, hard wedges of the Northern aire, they will ſo cleave and batter it, that in a little while it will exhale its ſpirits and dye. And the ſame reaſon obli-

ligeth alſo, that every piece of wood, even after it is dead and hewed out, be Magneticall and have reſpective Poles to the Univerſe. For, the conſtant courſe of one ſort of atomes running one way through it, muſt needs have bored and wrought ſuch figured Channells as are proportionate to admit ſuch figured and qualified atomes as they are, and to reject and repell others of a different nature and formation: In ſuch ſort as I have at large diſcourſed in my above mentioned Treatiſe, where

I ſet down the whole Doctrine of the Loadſtone and its Phœnomens, and do give the reaſons of them. From the ſame cauſe it will follow, that if you turn a piece of wood into a Sphere, or Cylinder, or other Regular Figure, and put it into the water, one preciſe ſide of it will always ſink, and the other ſwim out of the water. And out of what I have ſaid, the reaſon is evident, why after much drought in a hot Summer, Trees and Plants will languiſh, wither and look as though they were dead,

dead, till ſome Rain do fall to cure their ſickneſſe; and then all Vegetables take a new green habit, as though a ſecond Spring were come to animate them. All which is nothing elſe but that the long continued ſcorching Beames of the Sunne had Exhauſted all Humidity from the Plants: And then, freſh moiſture coming to the Rootes, it is ſublimed thence into the ſtalkes, and maketh a new Germination and Leaves in the manner I have declared.

Many other ſuch conſequencies would irrefragably

gably follow out of the premiſed principles, which would be too long to purſue further here. It is enough to have given the hint of thus much; after which any ordinary reflection will retrive innumerable other concluſions. But I think it will not appeare tedious to you that I touch a little upon what courſe may repaire a decaying Plant; or exceedingly augment the vertue of a proſperous one; ſince not onely the Philoſophy of it is pleaſing and conſiderable; but alſo the practiſe of it may be profitable

fitable to the Commonwealth, and uſefull (with due Analogy) even to humane bodyes. The Sickneſſe, and in the end the Death of a Plant, in its naturall courſe, proceedeth from want of that balſamick Saline juyce which I have ſaid maketh it Swell, Germinate, and Augment it ſelf. This want may proceed, either from a Deſtitution of it in the place where the Plant groweth, as when it is in a barren ſoyle or bad aire; or from a defect in the Plant it ſelf, that hath not vigour ſufficient

cient to attract it though it be within the ſphere of it, as when the Root is become ſo hard, obſtructed and cold, as that it hath loſt its Vegetative Functions. Now both theſe may be remedyed in a great meaſure, by one and the ſame Phyſick. It is not every humidity that is of a prolifike nature. If water have not her fire in her, ſhe will availe little to make Plants fructifie. The watering of ſoyle with cold hungry ſprings, doth little good. Whereas muddy Saline waters brought to over-

flow

flow a piece of ground, do enrich it much. Gentle ſhowers, eſpecially in the Æquinox Seaſons, are very fruitfull. But above all, well digeſted Dew, maketh all Plants luxuriat and proſper moſt. Now what may it be that endeweth theſe Liquors with ſuch prolifike vertue? The meer water which is common to them all, cannot be it. There muſt be ſomething elſe encloſed within it, unto which the water ſerveth but for a Vehicle. Examine it by the Spagyrick Art, and you will find it is nothing elſe

elſe but a nitrous ſalt which is dilated in the water. It is this Salt which giveth fœcundity to all things. And from this Salt (rightly underſtood) not onely all Vegetables, but alſo all Mineralls draw their origine.

Here, it were not from the purpoſe to put you in minde how the Ancient Poets (who compriſed their deepeſt wiſdome in familiar Fables) tell us long ſtories of their Salt-begotten Goddeſſe, and adumbrated their beſt knowledge of nature under Saline

Saline veiles. But I ſhould be too prolixe if I hunted too far every chace that riſeth before me in this copious Forreſt. I will come back to my own and others plain experiences. By the help of plain Salt-Peter, dilated in water and mingled with ſome other fit Earthy ſubſtance that may familiarize it a little with the corn into which I endeavoured to introduce it, I have made the barreneſt ground farre out-goe the richeſt in giving a prodigiouſly plentifull harveſt. I have

ſeen

ſeen hemp-ſeed ſoaked in this Liquor, that hath in the due time made ſuch Plants ariſe, as for the tallneſſe and hardneſſe of them, ſeemed rather to be Coppice wood of fourteen yeares growth at leaſt, then plain hemp. The Fathers of the Chriſtian Doctrine at *Paris*, doe ſtill keep by them for a Monument (and indeed it is an admirable one) a Plant of Barley conſiſting of 249. ſtalkes, Springing from one Root or Grain of Barley, in which they counted above 18000. Grains or ſeeds of Barley. But

do

doe you think that it is barely the Salt-Peter imbibed into the Seed or Root, which cauſeth this Fertility? no; that would be ſoon exhauſted, and could not furniſh matter to ſo vaſt a progeny. The Salt-Peter there, is like a Magnes which attracteth a like Salt that Fœcundateth the Aire, and that gave cauſe to the Coſmopolite to ſay, there is in the Aire a hidden food of life. Such Aires as are moſt impregnated with this benigne fire, are healthfull to live in. Others, which abound with

Earthy

Earthy exhalations or Mariſhy vapours, and have little balſamick Salt in them, are as unſound. This is the food of the Lungs, and the nouriſhment of the Spirits. *Cornelius Drebell*, having contracted a great quantity of this into a narrow room, could recreate and revive his languiſhing gueſts in his ſtrait houſe under water, when they had fed upon all the balſome that was in the Aire ſhut up with them; by opening a Fiole that dilated it ſelf with freſh Spirits into that ſtale depredated and exhauſted

ſted Aire. This ſpirit then that is in the Aire, is drawn (as it were by a Loadſtone) by the Saline Liquor that is imbibed into the Seed which is full of it. My own eyes are witneſſes of the wonderfull corporifying of it. I have ſeen it grow in a ſtrange proportion; In a Villa at *Rome*, I ſowed ſome Barley thus prepared; And what with the Dew, what with the Aire, and what with the Sun, I ſhould in the mornings, by then the Sun-beames had dryed up the ſuperfluous moiſture, ſee ſprout-

ings

ings up of pure Salt-Peter of a prodigious height all about and over the Seeds that lay ſlightly covered with the looſe mould. They would be above an inch, nay two inches long, of the pureſt Chriſtaline Salt-Pe- that could be ſeen. And it is upon this principle that the Pope in his State, and the old Duke of *Bavaria* in his, did firſt make and then nouriſh, Mines of Salt-Peter; whoſe Roots and Quarries are quite different from other Mineralls: For, they are under-foot in the Earth; and theſe over our heads,

heads, in the Aire : This is the Earth flying over mens heads, which a late ſubtill Philoſopher preſcribeth to be taken for his great work. Now in this Salt are encloſed the Seminary vertues of all things. For, what is it, but a pure extract drawn by the Suns-beames from all the bodies that he darteth his Rayes upon, and ſublimed up to ſuch a height of place as leaveth all feculence behind it, and is there in that exalted Region of the Limbeck baked and incorporated with thoſe very beames themſelves which

which refined this extract out of its droſſie Oar: Therefore I wonder not to ſee any ſort of hearbe grow upon the higheſt Towers, where it is certain no man ever came to ſow that Plant. And the Loadſtone or Magnes of a like ſubſtance (though nothing near ſo pure) that is in the Earth, the creeping toad there, ſucketh and pulleth down this flying Dragon to it; and both of them do become one body. And thus you ſee plainly and familiarly explicated the great Aphoriſme of the Smaragdine Table; *That what is above,*

is like what is below. The Sun is the Father, the Moon is the Mother; the Earth is the Matrix wherein this product is hatched; and the Aire conveyed it thither. This Universall Spirit then being Homogeneall to all things, and being in effect the Spirit of Life, not onely to Plants, but to Animals also: were it not worth the labour to render it as usefull to mens bodyes, as to the reparations of Plants? *Albertus Magnus* purchased the reputation of a Magician, for making all sorts of Fruit grow plentifully and perfectly, in the depth of a hard

Win-

Winter in *Germany*, by meanes of this æthereall balsome. If it were made proportionable to mens bodyes, there is no doubt, but it would work alike effect upon them. Gold is of the same Nature as this æthereall Spirit; or rather, it is nothing but it, first corporifyed in a pure place, and then baked to a perfect Fixation. *Raymund Lully* in his excellent Treatise *de intentione operantium*, describeth admirably well the Genealogie of it. If then this perfect body (I mean Gold) could be rendered familiar and disgestible to ours,

there is no doubt but it would prove a kinde of Tree of Life to us. It is of it self too firmly composed for any Agent upon Earth to dissolve it. But peradventure the Mother that bore him, may reincrudate him and reduce him back into his first volatile principles.

Enough, if not too much is said of these Curiosities by way of digression, and to entertain you (Noble Auditors) with pleasing variety; Let us come back to our Plant, and enquire if it be not possible to render it perpetuall, or rather to convert it into a per-

permanent ſubſtance and ſtate, no longer ſubject to the Viciſſitudes of time; and outward Agents, that deſtroy all things: So to bring it to a kind of glorifyed body, ſuch as we hope ours will be after the Reſurrection. *Quercetanus* the famous Phyſician of King *Henry* the fourth telleth us a wonderfull ſtory of a *Polonian* Doctor that ſhewed him a dozen glaſſes Hermetically Sealed, in each of which was a different Plant; for example, a Roſe in one, a Tulip in another, a Clove-Gilly-flower in a third; adſo of the reſt. When

he offered theſe Glaſſes to your firſt view, you ſaw nothing in them but a heap of Aſhes in the bottom. As ſoon as he held ſome gentle heate under any of them, preſently there aroſe out of the Aſhes, the Idæa of a Flower; the Flower and the Stalk belonging to thoſe Aſhes; and it would ſhoot up and ſpread abroad to the due height and juſt dimenſions of ſuch a Flower; and had perfect Colour, Shape, Magnitude, and all other accidents, as if it were really that very Flower. But when ever you drew the heate from it, as the Glaſs

Glaſſe and the encloſed Aire and matter within it grew to cool by degrees, ſo would this Flower ſink down by little and little, till at length it would bury it ſelf in its bed of Aſhes. And thus it would doe as often as you expoſed it to moderate heate, or withdrew it from it. I confeſſe it would be no ſmall delight to me to ſee this experiment, with all the circumſtances that *Quercetan* ſetteth down. *Athanaſius Kircherus* at *Rome* aſſured me he had done it; and gave me the proceſſe of it. But no induſtry of mine could effect

it. Another I did, by instructions from the former Author; and I found it exactly true as he recounteth it. It is worth your knowing. I calcined a good quantity of Nettles, Roots, Stalks, Leaves, Flowers; in a word the whole Plant. He produceth the example in this very Plant; and I would not vary in the least circumstance from what he taught. With fair water I made a lye of these Ashes; which I filtred from the insipide Earth. This lye was exposed by me in the due season to have the Frost congeale it. I performed the whole work

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in this very houſe where I have now the honour to diſcourſe to you. I calcined them in the fair and large Laboratory, that I had erected under the Lodgings of the Divinity Reader: And I expoſed the lye to congeale in the Window of my Library, among my Lodgings at the end of your Great Gallery. *Hans Hunneades* the *Hungarian*, was my operator. And it is moſt true, that when the water was congealed into ice, there appeared to be abundance of Nettles frozen in the ice. They had not the colour of Nettles. No

greenneſſe accompanyed them. They were white. But otherwiſe, it is impoſſible for any Painter to delineate a throng of Nettles more exactly, then they were deſigned in the water. As ſoon as the water was melted, all theſe Idæall ſhapes vaniſhed: but as ſoon as it was congealed again, they preſently appeared afreſh. And this game I had ſeverall times with them, and brought Doctor *Mayerne* to ſee it; who I remember was as much delighted with it as my ſelfe. What could be the reaſon of this Phœnomen? There is no doubt but

but that a main part of the Essentiall substance of a Plant is contained in his fixed Salt. This will admit no change into another Nature; but will alwayes be full of the qualities and vertues of the Plant it is derived from; but for want of the volatile Armoniacall and Sulphureall parts, it is deprived of colour. If all the Essentiall parts could be preserved, in the severing and purifying of them, I see no reason but at the reunion of them, the entire Plant might appeare in its complete perfection, so one could finde a fit medium

to

to dilate it in. Were not this then a true *Palingeneſis* of the originall Plant? I doubt it would not be ſo. For ſpeaking rigorouſly, I cannot allow Plants to have Life. They are not *Se Moventia*, They have not a principle of motion within them. It is the operation of outward Agents upon them, that ſeteth on foot all the dance we have above ſo heedfully obſerved, and which ſo near imitateth the motions of Life. And if it be not a living thing, then it is all of it in perpetuall Fluxe and Change, without having any part of it

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enjoy a fixed and permanent *Being*, for the leaſt moments ſpace; and conſequently, there can be no Reſurrection of it after once it is deſtroyed, ſince it never was at any time a determinate *It*, or *Thing*; But as Coales are made of wood by the action of Fire upon it; and Aſhes again of them, and Glaſſe of Aſhes; each of them a quite different ſubſtance from what the precedent was: So, I conceive that a new aereall body and thing is made out of the Plant that furniſhed matter for this new ſubſtance, and whoſe ſubſtantiall form is

to-

totally deſtroyed, and a new one produced into the World; which is accompanyed with many accidents like unto many of thoſe that belonged to the precedent ſubſtance. I remember another pretty experiment that Doctor *Daviſſon* ſhewed me in his Laboratory at *Paris*. He had been drawing the Oyle and Spirit of a certain kind of reſinous Gumme: And it ſo happened that the Glaſſe along which it roſe; was all covered over on the inſide with Portraitures of Firre-Trees (from whence that reſin diſtilled) ſo exactly

actly done that no Painter in the World could have drawn their ſhapes more compleatly. The like happened to me once in diſtilling the Gumme of Cherry-Trees. But none of theſe Idæas doe come ſo neare unto the reall *Palingeneſis*, as what I have done more then once upon Cray-Fiſhes. Waſh them clean from any Earthineſſe; and boyle them very throughly (at leaſt two houres ſpace) in ſufficient quantity of faire water. Keep this decoction, and put the Creviſſes into a Glaſſe-Limbeck, and diſtill all the Liquor that will ariſe from

from them; which keep by it self. Then calcine the Fishes in a reverberatory Furnace, and extract their Salt with your first decoction; which filter, and then evaporate the humidity. Upon the remaining Salt poure your distilled Liquor, and set it in a moist place to putrifie; and in a few dayes you shall find little animals moving there, about the bigness of Milet Seeds. These you must feed with bloud of an Oxe, till they be as big as pretty large buttons, then put them into a wooden paile of River-water and Oxe bloud, chang-

changing the water and bloud every third day; and so you may bring them on to what bigneſſe you pleaſe.

All this leadeth me to ſpeak ſomething of the Reſurrection of humane bodyes. There we may find ſome firm and ſolid footing. Hitherto we have wandered up and down in the Mazes of Fleeting matter, *quæ nunquam in eodem ſtatu permanet.* And with great truth did *Job* apply that expreſſion to the State of men living in this World. But as ſoon as we ſhall have put off our frail Mortality, we ſhall be in a ſtate of permanence

manence and immutability. Not onely whiles the Soul is seperated from her Earthy Companion, but when she shall be cloathed again, that new flesh will partake of the constancy of her glorious Mate. But why doe I call it new flesh? I may be pardoned for doing so, when I consider the new qualities and endowments it shall have put on. But otherwise, in substance and reality, it is the same, the very same, that (for example) accompanyed me in this long and tedious Pilgrimage upon Earth. How is this? If a Caniball should feed upon

on my body, and convert it into the ſubſtance of his, can both of us riſe again with the ſame bodyes we enjoyed here? Yes, without doubt we may. And I conceive, that the taking away of this difficulty, which hath ſo highly perplexed even the beſt Chriſtians, will be ſo welcome a performance to them who yet have not met with it; that for its ſake you will pardon the tedioufneſſe and courſeneſſe of all I have hitherto ſaid. And with that, I will ceaſe further troubling you. But let us firſt rightly underſtand one another. I doe not undertake

take to shew here how this great work is wrought: nor much lesse to determine that it will follow out of the force of nature, after the great dayes Conflagration hath calcined the whole Masse of Matter into a formlesse heap of Ashes: So disposing it, by excluding and destroying all particular formes, to admit the action of subsistent ones upon it. But my undertaking is, to convince that there is no impossibility nor contradiction in nature, against this great and amazing Mystery. If there were contradiction in it, it could not be true;

it

it were not the ſubject of a Miracle. But if I prove that there is no repugnance againſt the feaſibility of it, I am confident I ſhall not miſſe of hearty thanks from thoſe ſincere believers who have nothing to ſhake the firmneſſe of their Faith, but the ſuſpected impoſſibility of the Myſtery. Thus then. I ſhall begin with enquiring what it is that maketh a body continue ſtill the ſame. All bodyes are compoſed of matter and form. In ſaying of which I doe not mean that there are two diſtinct entities, which being put together like meal and water doe

doe concurre joyntly to compoſe a body, as they make bread. But they are notions which are grounded upon a reall Foundation in the object from whence they ariſe. In the object there is that, which correſpondeth adæquatly to the notions we frame of theſe two principles. We ſee that this which is now Coal, was larely wood, ſomewhat muſt be common to both theſe diſtinct ſubſtances; elſe, we muſt allow the firſt to have been anihilated by the change, and that nothing remaineth of it after the action of fire: And conſequently

that

that the ſecond is abſolutely created, without any præexiſtent matter to ſerve for a Baſis to this production. This obligeth us to have recourſe to ſomewhat that is common to both theſe things. This that is thus common to both, is of it ſelf neither the one nor the other: But is that, which may be either the one or the other. So that truly it is not this nor that nor any determinate thing: But it is a Capacity to be this or that or any thing whatſoever. And this capacity, is called in the Schooles, Matter. Now that which filleth and actuateth

actuateth this capacity, and maketh it be a determinate thing, is that which they call the Form. So that the Form, is the compleating and perfecting of a body, and maketh it to be this or that, and fixeth it in the State of *Being*: whereas the matter abstracted from the Form, hath no determinate being, no individuation, is in effect and actually nothing; but hath, or rather is a capacity to be any thing. It must not then be on the side of Matter, that we must look for the individuation and Identification of our bodyes after the Resurrection. All mat-

ter is indifferent to every Form. There is no this or that in matter; otherwiſe then as the Form engroſſeth it to it ſelf; and thereby maketh it this or that. And conſequently as long as the Form remaineth the ſame, the thing is the ſame, and the matter is the ſame. Were it not for this, how could any body under Heaven remain the ſame even but for a ſhort Moments ſpace? All ſublunary things are in a perpetuall Flux. The contraſt of the Elements among themſelves, within every body; and other bodyes

without it, working alſo perpetually upon it, are cauſes that out of every body there are continuall emanations, and that there are continuall ſupplyes advenient to it. Every thing is like a River that is in a perpetuall courſe. Which though we account it the ſame River to day as it was yeſterday; yet in truth there is not one drop of water in it to day that was in it yeſterday. But becauſe it is filled out of the ſame common Magazine of (in it ſelf) undiſtinguiſhed water which filled it yeſterday and a hundred yeares agone; and that

that it is compriſed in the ſame Channell; It is ſtill eſteemed to be the ſame River. I remember to have ſeen in the King of *Frances* Garden at Saint *Germain*, very curious Grottos; whereof one was adorned with a caſt of water, ſo contrived, that as faſt as the water fell down into the reſerve or Baſin which was at the bottom of the Pipe that caſt it up with force a pretty height, the water was ſtill conveyed up again into that caſting Pipe; and ſo made a kind of perpetuall motion. The Gardiner to entertain his Spe-

ctators did uſe to put ſundry hollow inſtruments of different ſhapes and Figures upon the mouth of the Pipe that did caſt up the water, ſo that the coarcted ſtream would ſpread it ſelfe abroad as ſoon as the inſtruments afforded it liberty, ſometimes like a Bell, ſometimes like a Crown, otherwhiles like a Flower de Luce, and the like, according to the Form of the Inſtrument that compriſed and governed the courſe of the water. There were ſeverall Bells and ſeverall Crownes, with peculiar differences belonging to them; and ſo of the reſt

of

of the Machines. If now after I had ſeen two or three differently appearing Bells, or Crownes; I ſhould deſire to ſee again that Bell, or that Crown, which the Gardiner ſhewed we firſt, and he ſhould put on that Machine which he did put on the firſt time; ſhould I not have reaſon to ſay it were the ſame Bell or Crown I ſaw firſt? The water that furniſheth matter to all theſe varieties and games, is ſtill the ſame. As long as it is in its great bulk, there is no this or that part of it: all of it is one Maſſe, that hath no this or that di-

ſtinguiſhed any where in it. But if you take never ſo few drops of it in a particular veſſel, that divideth it from the reſt; then, there is this glaſs-full (for example) diſtinct from the reſt of the common Magazine. And ſo, whiles the firſt Engine or Pipe to repreſent a Bell, is put on a ſecond time; it denominateth truly that Bell to be the ſame that it was at firſt; and while it is in continuall flux of new parts of water ſucceeding thoſe which run down into the Baſin, and that riſe again to continue that figure; it is ſtill the ſame Bell. Much more rigorouſly is it true that

that my eyes, my ears, my whole body, now after near 60. years durance in nature, are the ſame, the very ſame, they were, when I lay a weak Embryon in my Mothers womb. The continual floud of tranſpiration, and the continual ſupply of augmentation, do nothing hinder the Identity of this body of mine, as long as the Form which maketh it to be what it is, remaineth ſtill the ſame. If then the Form of Man, which is his ſoul, remaineth the ſame after its ſeparation from the body, as it was whiles it was copartner with the body; what difficulty is there to allow

her to have the ſame body ſhe had in this World, if ſhe be built up again to a whole Man, out of the generall Magazine of matter which furniſhed her with a body before; and which hath no this or that belonging to her, otherwiſe then as ſome form engroſſing her maketh her to be this or that body? There is nothing more clear, nothing more evident, nothing more rigorouſly true.

FINIS.

ERRATA.

PAge 4. line 9. all this now, would p. 17. l. 4. are thrown out p. 24. laſt l. more juice, p. 36. l. 2. rather now ſpirit, p. 43. l. 7 in every parcell, p. 52. l. 10. new juice diſtendeth, p. 53. l. 4. grew when it was planted, p. 54. l. 18. formation, p. 67. l. 9. Salt-Peter that, p. 68. l. 18. exalted Region of, p. 90. l. 13. 14. wood. Somewhat.